

Building or extending a hospital department: Radiology

A path through the planning minefield

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This is the first of a series of articles on the planning and building of a new radiology department or the extension of an old one. While the series focuses on a radiology department, it will be of interest to anyone who is planning any part of a hospital, particularly in the detailed information about the planning process and the part to be played by hospital staff during the subsequent building and commissioning.

BACKGROUND

You want a new X-ray department or you want a bigger one. What are you going to do about it? First of all, you will have to make out a case for it; you will have to convince a lot of hard-headed administrators, planning officers and financial experts that they have to find the money for *you*. There will be lots of other people after that money. There will be difficulties in convincing people that you have the greatest need, and to stand any chance at all, you will have to do your homework properly. It is likely that only once in a career will you be leading an attack on the treasurer and the planning officer for big money. They have experienced it all before, so they 'eat for breakfast' anyone who presents a half-baked idea.

Building notes

In the National Health Service one of the most important sources of help in presenting your case is *Health Building Note 6: Radiodiagnostic Department*, hereafter referred to as *HBN6*. It is one of a series of such *Notes* covering most aspects of hospital design: at the back of each there is a list of those currently relevant to health building, but inevitably some are out of print. They are the official guidance for the building of new hospitals or the enlarging of old, radiodiagnostic departments included. They contain a large amount of information which is derived from a wide experience in planning, building and subsequently using hospitals. In the NHS they can be obtained through your District administration, usually via the Supplies Officer. With the amount of information contained, they are also helpful to those who are building outside the NHS. Anyone can purchase a copy from Her Majesty's Stationery Office (HMSO) for a few pounds. *HBN40 (Common Activity Spaces)* may also be helpful: this comes in four volumes, the first two of which were published at the same time as *HBN6*. Also to be mentioned are two other series which can be obtained from HMSO, although they will not be helpful until later in the planning process: *Health Equipment Notes* and *Design Briefing Systems*, the relevant ones being *HEqN6* and *DBS6*.

A *Building Note* is an official Department of Health and Social Security document which can be quoted in

any argument, but it is a two-edged weapon as the planners can quote it against you if you are asking for too much. Read it and know it well; the planners will.

Health Circulars

Advance copies of *HBN6* were circulated to Regions early in 1985 together with a Health Circular, *HN(85)1*, authorizing their use. This Circular has particular importance in the NHS as it has an annex detailing cost allowances and suggested areas for new departments. In these inflationary days the cost allowances will vary and new Health Circulars will be appearing regularly; as early as the end of 1985, the first of these had appeared authorizing an increase of 7% [*HN(85)34*]. More permanent are the suggested areas of rooms, corridors, etc., which are used in the calculation of the cost allowances; the individual areas are quoted in the appropriate parts of this series and will be useful guidance to those outside as well as inside the NHS. To emphasize the flexible approach to planning, these figures were not given in the first edition of *HBN6*, but we understand they will be in subsequent editions with a note that they are for guidance only. The overall figures are given in Table 1.

Briefing the architect

The *Building Notes* contain information which will help in the preparation of a case for the new or extended department and in the subsequent planning, particularly the briefing of the architect. Familiarization with it may stop you making silly mistakes, for example, accepting a site for your department where the access is poor, or where there is no room for expansion, or even worse where the department is already too small *and* there is no room for expansion. It will help in early and accurate briefing of the architects; they want to help you but become disenchanted if you change your mind, particularly if the 'change' is made because the original briefing was incomplete or lacking in precision. Such failings make work, for the revision of a whole set of drawings can be very time-consuming and can introduce errors which may be expensive to correct in the building stage.

Compilation of *HBN6*

It is the involvement of the authors in the preparation of the new edition of *HBN6* (published June 1985) that has resulted in the writing of the present series to supplement it. *HBN6* is published on behalf of the DHSS, which is responsible for all it contains. The DHSS is very concerned to see that all departments are built or extended both economically and well, that they are convenient for patients,

Table 1. Suggested areas and current cost allowances for new radiodiagnostic departments. (Figures taken from Annex 1A of HN(85)1 as amended by HN(85)34)

No. of rooms	Area of department (m ²)	Cost allowance (£000)
4	740	419
5	865	481
6	975	535
7	1120	605
8	1225	660
9	1405	755
10	1570	841
11	1725	926
12	1820	982

pleasant to work in and efficient to run. To help to achieve this, professional advice is taken from radiologists and radiographers in day-to-day clinical work.

By agreement with the profession, all *Building Notes* must be approved by the Joint Consultant's Committee, which is made up of representatives of the Royal Colleges and of the Central Committee for Hospital Medical Services which, in turn, represents the career grades. In the past, the final draft was put before the whole Committee. This led to difficulties, with too many people looking at a long document with too little time to study it properly. Indeed, many were not interested, a particular *Note* being too far away from their own 'area'.

The 1985 *HBN6* was one of the earliest to have a new system. The JCC was asked to appoint two radiologists to represent the profession throughout the process of producing the up-to-date edition; they would see the book develop and approve it as it grew, step by step, so that a rushed, last-minute 'consultation' would be avoided. Eric Roebuck and Don Manton were so appointed. The DHSS wanted radiographer input as well, and Geoff Fordham was asked to provide this.

The three of us brought considerable professional experience to help in the writing of *HBN6* – we knew what radiologists and radiographers wanted. As a side effect, we learned a lot about planning from the administrators, planners, architects and engineers.

This series

From our knowledge of the various sorts of 'planners', we are convinced that one of the major problems in planning is the lack of understanding that exists between the various people who are playing their particular parts in the complex procedure of turning a pious hope into a well designed department which is running smoothly. The *Health Building Note* series is intended to explain aspects to the other side – the running of an X-ray department to an architect and a planner, planning to X-ray staff, etc. But there are limitations: a comprehensive book explaining everything to everyone would be enormous, and the DHSS cannot offer all options nor can it appear to recommend any particular option unless the case for it is absolute. On the other hand, we are not limited in writing about options and giving the pros and cons;

also we have written this to try to bridge the gap for a specific group, the X-ray staff. We hope we give information which can be used to persuade the planners to accept the options you have chosen.

Should you find statements of the obvious (some repeated several times), no apologies are made. It may be 'obvious' to you, but there will be many who know little about the running of, say, an X-ray department and who will need to be told the 'obvious', usually by you as no one else knows enough. Even you need to think carefully about the 'obvious' and to make sure you understand what it is; also to make sure that *what you do say* is *what you think*. There is a saying in the computer world, 'Rubbish in, rubbish out', and this is just as true in planning.

This series of articles offers a path through the planning minefield as we have encountered it. No doubt there are other paths, and each project will have its own individual minefield, but there are two golden rules which will apply to any pathway:

- (1) If you want something, you will have to work hard for it and at times fight for it. Other people want to spend the money on their own project.
- (2) Architects must be properly briefed: they want to build the department that *you* need. To do that briefing you must be properly informed, so collect information from all sources, but particularly *Health Building Note 6: Radiodiagnostic Department*. This is the official guidance.

THE PLANNING PROCESS

There are many similarities in planning wherever you go. Most of our references will be to the United Kingdom, but it will require only a little thought to adapt this to the local circumstances in other parts of the world. For example, what is described below as 'local' or 'small' refers to District developments in the UK, but will apply to the type of development which is likely to be carried out within the departmental budget in many other countries, but with full local consultation to avoid clashing with the needs of adjacent departments or the timing of work on other projects.

Projects

It is convenient to divide projects into small, medium and large. In the UK this has important administrative implications and alternative names are District, Regional and DHSS. Even in the NHS there will be variations between Districts and between Regions, and there will be future changes in the financial limits in these inflationary days. To give an example of the limits at the time of writing, in South-West Thames RHA, small or District projects will be those costing less than £150 000 and will be funded out of the District's capital budget. Medium or Regional projects will be those costing over this and will be funded out of the Regional capital budget; normally the project will be carried out by Regional officers although projects up to £300 000 may be delegated to the District, funding remaining with Region. Large or DHSS projects will be those over £5 million for which approval will have to be obtained from the DHSS before the project can proceed, but funding and management remain with Region.

In the NHS, all projects must conform to *Capricode* (see below), with any differences in the planning

procedures for different-sized projects being of degree rather than method. In *HBN6* and later in this article under 'Mechanics of planning' it is the large project that is discussed. Yet it should be remembered that while a small project will be less formal and the input of work will appear to be less, if essential steps are missed out, errors can be made just as easily as in a large project and the resultant 'improvement' can prove to be a nightmare.

For any project there must be a clear idea of what is wanted, with the full support of those within the department—the other radiologists, the superintendent radiographer, and also the office staff if their area is involved. Have plenty of preparatory discussion so that the needs are clear and the support is guaranteed. An ill-defined project poorly supported will be referred back; others may get ahead in the queue and long delays can arise.

At some stage it will be necessary to discuss the project with the medical staff as a whole to obtain their approval—the District Medical Committee or its equivalent. Circumstances will determine the timing of this: for a purely intradepartmental project it can be late, but with a multidepartmental project it should be early.

The small project

Most of these will originate within the department and would include, for example, building a small extension to provide an office for a new radiologist; converting a darkroom to daylight processing; or creating an extra room for new apparatus. There may be some projects in this group which originate outside the department, e.g. a new archival film store to free the 'old' one for other uses; this can be advantageous as it may be possible to derive additional benefit for the department from this situation as the administrators want something from you.

Project acceptance: For a small project, this will be local. When the department's ideas are clear, further preliminary work is essential before formal presentation to the appropriate person, e.g. District General Manager or District Planning Officer in the NHS, but it is one of the advantages of a local project that informal discussions can take place at any time. There is no point in wasting effort on what could prove to be a non-starter. The possible alternatives will have to be looked at—a process called 'option appraisal'. Even in a small project there will be alternatives: the space may be wanted for some other project and one scheme may have an alternative but not the other. You will need to know in outline the service needs of any special apparatus to be installed, which should be discussed with the supplier(s) you have in mind; they will often do outline drawings for you and provide other assistance. In the NHS there will be a Regional X-ray Engineer who will give expert advice although he may not wish to have detailed involvement in a District project, and no doubt a similar source of expert advice exists outside the NHS but with a different name. Consult the District Engineer, the Works Officer or his equivalent for advice on the building problems. Will it interfere with other parts of the building? Can the services be provided? Are there any restrictions because of fire regulations, etc.?

By now the plan should be ready to present for formal approval. Arrange the first of what will be a series of discussions with the appropriate officer, who in the NHS will be the District General Manager or the District Planning Officer.

Agreement to proceed: Having the necessary support, work starts in earnest. Now people are about to spend money. A Project Team will be set up, often so informally that you will hardly notice its coming, possibly only the District Engineer and the District Planning Officer and you. The plans must be more detailed so that the financial commitment can be clear; for example, the drawings will be to scale and include details like electric sockets, telephone outlets and wash basins. The *Health Building Notes* must be studied carefully, *HBN6* and others if appropriate; often administrators will know nothing about the development needs of an X-ray department other than what they read in these *Notes*. Be prepared for critical questioning on all points. Other people will want the same slice of the cake, and you may have to fight hard to keep your project moving.

The go-ahead: It may take months or even years to get approval to actually start building. Often you may have despaired of ever seeing that extension, and the eventual 'go-ahead' will come as a relief—but do not think you can relax. Working drawings have to be prepared so that they can go out to tender: after the contract is signed, building proceeds.

Much of the supervision is likely to be delegated, and the smaller the project the more that will land on your shoulders. If something is forgotten, there may not be anyone to give you a reminder. For example, in one daylight conversion project, nobody ordered any of the special film required. In another project, it was only discovered late in installation that no high-tension cables had been ordered to connect the generator to the X-ray tube; that defies belief but it is true. You will be the one with egg on your face if this sort of thing happens, so take care. But being left to get on with it does give you the opportunity to 'do your own thing', so seize it while you can.

The medium project

There will be a very wide range of projects in this category. Many will originate in the department and involve no other part of the hospital, but many more will include other parts of the hospital. Indeed, the X-ray department may be only a minor part of the project and you may have to work hard for your voice to be heard. There will have to be a considerable amount of preliminary work locally before the project can go to Region. This will be done under the guidance of one of the local officers, and the larger the project the more senior he will be. Much work may be required to coordinate the needs of different hospital departments. For example, an extension to X-ray on the ground floor may also allow an extension to theatre on the floor above, and such a project will be greatly strengthened by meeting two needs and having two voices. Two schemes built together are more economical than one at a time. But even if there is no other department involved, *do not try to go it alone* to Region because they will not consider for a moment any project which does not come to them with full local support. At a very early stage tell the Regional

X-ray Engineer what is proposed; he will form a valuable link with the other planners at Region and will make sure your case contains all the necessary information when it comes up for approval. With help from all these people, you should make your way successfully through what is often a minefield. It will be even more important than with a small project to have done your homework properly.

The 'small' medium: If the project is 'modest' in size it is liable to be returned to District for implementation. For example, in South-West Thames in 1986 this applied to projects costing between £150 000 and £250 000, possibly up to £300 000. As a fixed sum of money will be made available, it is essential to make sure that the plans submitted are comprehensive so that the allocation will be sufficient. Professional architects and others may be required, but often the only difference in implementation between these and small projects will be that the money is coming from Region.

The 'large' medium: Larger projects will be managed by Region, whose officers, planners, architects, engineers and others will take it over. Their experience with many previous completed projects, though not necessarily a previous radiodiagnostic department, will usually prevent silly mistakes being made. But they will also have gained many ideas which they may want to introduce into your project, so you must have your own ideas clear before you go to Region. Look carefully at any alterations that may be suggested in light of past experience, but do not forget your own aims and be prepared to argue for them – in friendly argument, as is appropriate between professionals. Stick to saying what service you want out of the development and avoid telling them how to do their job.

Project Team: To comply with *Capricode* (see below), a formal Project Team will be set up (see also paragraph 2.1 of *HBN6*). Everything will have to be in writing. To keep a record of decisions, the *Design Briefing System* books will be helpful, particularly *BDS6*. Any decision will be argued closely, and a careful study of the *Building Notes*, in particular *HBN6*, will be necessary so that you can argue from strength.

The large project

This is the project that is so large that it has to go to the DHSS for approval – a new wing, perhaps, or possibly a complete new hospital. Before detailed work can start there will have to be full, written 'option appraisals'. As noted earlier, these should be done for any project, but they will be very informal with the smaller projects. For large ones, however, all the possible alternatives will be looked at and assessed, each option being considered formally. Stating the obvious is not sufficient – you will have to prove it. Large projects are very formal, with everything in writing and nothing left to chance. You may well feel that this is all an administrative ploy to delay *your* project. However, the bigger the project the more likely that it will come to the notice of the politicians, who can make life very awkward for a civil servant who has not gone according to the book. So be patient: as a taxpayer, you want to be certain that 'they' are not wasting *your* money.

Mechanics of planning

Taking a project from a pious hope to a working department is a long, hard road, and it is important that anyone who sets out on it accepts the work and commitment that will be required. The majority of radiologists and superintendent radiographers are unlikely to have much previous experience to call upon, certainly for a large project. However, they and their successors will have to live and work in the end result of that first attempt.

Capricode

The above notes on the various-size projects give a picture of the process as seen by the radiologist and radiographer. When planning and building, the Regional and District Health Authorities and their officers are compelled to follow *Capricode* (Capital Projects Procedures) and operate systems of approval, monitoring and control which are compatible with it. This was revised in 1986. It is a logical sequence of events. The document itself emphasizes that it is only a framework, the results depending on how the Appraisal Project Teams use that framework.

As you will have to work with the Regional and District officers, it is useful to know the constraints which apply to them. The *Capricode* sequence of stages is:

- (1) Approval in principle (AIP).
- (2) Budget cost.
- (3) Design – a long process when sketch plans are developed into working/production drawings ready to go out to tender.
- (4) Tender and contract – normally the tender documents go to a chosen group of contractors of proven ability: 'selective competitive tendering'. There may be a variation in procedure with the tender going out early if the contractor is to help in the design, e.g. building an extension for the installation of a CAT scanner.
- (5) Construction.
- (6) Commissioning (discussed in a later article in the series).
- (7) Evaluation – this should be a continuous process. At each stage, what has been done should be assessed and consideration given to possible effects on future progress of the scheme. Overall effectiveness can only be assessed when the project is complete *and* working.

The 'critical path' shown in Figure 1 is a pictorial representation (with additions) of *Capricode* for an X-ray department, but it will be similar for other projects; for example, to apply it to the building of a theatre suite, all that is required is to replace Radiologists/Radiographers with Surgeons/Anaesthetists/Nurses.

Two other 'jargon' words, both only applicable to the NHS, need a brief explanation:

CONCODE: a guidance document on the procurement of building and engineering work and the commissioning of consultant architects and engineers.

CONCISE: a computer-based integrated health building information system to help in the planning and management of projects. It may be used for any scheme, but it *must* be used for those over £1 million.

As *Capricode* points out, all steps in planning have a cost implication and this should not be forgotten. For example, the extent of any appraisal should be tailored to the size of the project, so time should not be wasted working on a new stage of planning until the previous one has been completed. The stages (above) of *Capricode* are subdivided, each subdivision itself having numerous steps within it. The full document should be consulted for the details, but here

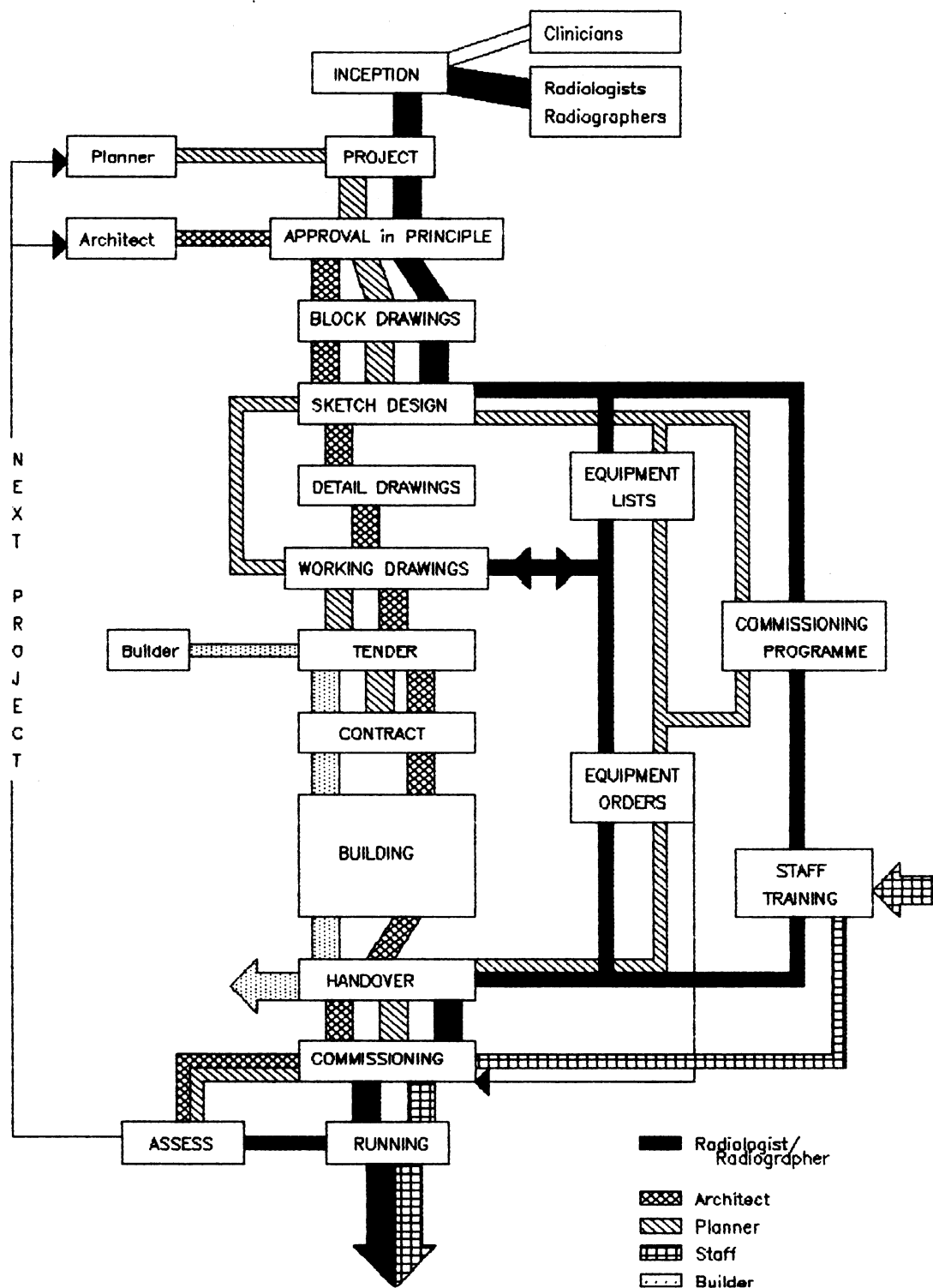


Figure 1. A critical path chart for the building of a radiodiagnostic department based on Capricode, the DHSS Capital Projects Procedure

follow some guidance notes on the first two stages for the benefit of working radiologists and radiographers, and also surgeons, physicians, nurses, etc., involved in other projects.

(1) *Approval in principle (AIP)*: Once it has been decided that a project has sufficient merit to start an appraisal, a Project Manager will be appointed and an Appraisal Team set up, with membership limited to those making an essential contribution to the relevant stage, changes in membership being considered at the end of each stage. The members will be drawn from those managing and operating the

services (doctors, radiographers, nurses, etc.) and those administering assets and resources.

Three early steps will heavily involve the doctors and paramedicals: (1) inception; (2) defining objectives and criteria for development; and (3) option appraisal. Inception of many projects will come from 'us'; we will be heavily involved in definitions either as originators or future users, and whether we like it or not we will have to contribute to option appraisal – the process of identifying a need and selecting the optimal means of meeting that need. However tedious it may be to spend time on some of the options, the omission of any can invalidate the whole stage which

will have to be started again! *Capricode* points out that the aim is to find the most cost-effective scheme, not merely the cheapest. For a complex project, some parts may require a separate Appraisal Team within the main one; we add 'e.g. the Radiodiagnostic Department'. At this stage drawings will be block diagrams, giving outlines without much internal detail.

(2) *Budget cost*: Once the decision has been taken that the solution involves building, either new (in which case site options will have been considered during AIP) or the extension of old, a Project Team will be set up. This is so important it is considered below in a separate paragraph. The job of this team is to develop the scheme, drawing up a brief which includes site, size and scope of the development, subsequently moving to specific layouts of individual rooms and spaces, detailing their contents and arriving at cost implications – both capital and revenue. *Capricode* includes in this stage the development of operational policies, both whole hospital and departmental, phrasing this in a way which suggests that preliminary policies form part of the AIP stage, although there is no mention of them there. The drawings at this point will be sketch plans and some internal room details.

Project Team

This will operate through all stages after AIP. As with the Appraisal Team, it will be a multidisciplinary group; for continuity *Capricode* recommends that it contains many of the Appraisal Team people. It will be chaired by the Project Manager and will include Regional officers or outside consultants (capital planning officer, architect, quantity surveyor, engineer, etc.) and local representatives (doctors, nurses or radiographers and administrators); for an X-ray project the Regional X-ray Engineer will be particularly important. The doctor will usually be a consultant member of the hospital staff and if multiple departments are involved it will be fortuitous if he is a radiologist. The doctor's role is to represent all clinical interests and to act as a bridge between the team and all his colleagues. From the earliest stage onwards, it is very important that there is direct radiology input when anything remotely affecting the radiodiagnostic service is involved. Unless a radiologist or radiographer is present, it is probable that none of the Project Team will have a detailed understanding of the needs of a radiology department; this will be equally true of clinical consultants and of administrators. If the X-ray department forms a substantial part of a project, it may be necessary to set up a special subteam for it, such as may have been required during appraisal. Rarely will a radiographer be on the main Project Team, but there should be one on any subteam (see below).

There will be many conflicting interests within the team. In particular, the 'professionals' will always have one eye on the cost, trying to keep demands from all disciplines to what they consider a realistic level so as to keep within the cash limits. Care must be taken to ensure that unreasonable constraints are not allowed to affect the efficient functioning of the end result. They will want prompt answers to any questions, and while nothing will happen in bricks and mortar for months or years, to them an answer

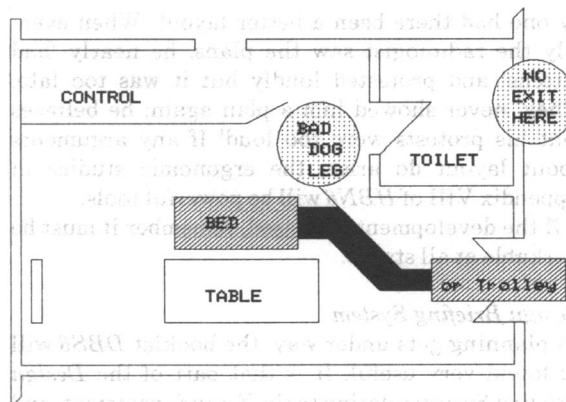


Figure 2. A poor room layout which slows the work flow but cannot be altered because of fixed features like doors, toilets and access to processing area

was necessary yesterday or the day before. If you do not answer, decisions will be made just the same and you may not like the result. Once past the sketch-plan stage, they do not want to change layout because redrawing a working/production drawing is time-consuming and costly, and there is the danger that an alteration on one drawing does not find its way to all the associated ones – the wash-hand basin has moved but the plumbing has not!

Project subteam

As noted above, in a major project with an X-ray department, a radiology subteam will be set up to undertake the detailed planning of the department.

'A consultant radiologist, an experienced radiographer with expertise in radiological practice and procedures and a radiological engineer... should be involved with the project team from the beginning and throughout the continuing stages of the project' (*HBN6*, para 2.1).

It is of paramount importance that radiology staff are involved in discussions concerning size and location of the department as well as the subsequent internal layout (see also *HBN6*, para 4.19).

You should say what function is *required* rather than how to provide it. Just as a radiologist dislikes a surgeon telling him how to do a barium meal, an architect does not like being told he needs an RSJ (rolled steel joist) – as one of us was unwise enough to do (the structure of the building necessitated a different means of special support for an overhead suspension in a particular room).

The need for proper discussion is highlighted by the following example. During the planning of one hospital which the authors visited, lack of any discussion on diagnostic rooms resulted in a very inconvenient layout of some of the X-ray rooms, as shown in Figure 2. Functional requirements could not be met. The fixed parts of the room made any alternative arrangement of the apparatus impossible. There were no problems with walking patients, but a very inconvenient dog-leg for chairs and trollies became almost impossible with beds, particularly with traction or drips, i.e. those patients where easy movement was most desirable. As the only entrance to the toilet was from the X-ray room, it was impossible to start a second barium enema until the first patient had finished evacuating. Two screening rooms were required to do the work that could have been done

by one had there been a better layout. When eventually the radiologist saw the plans, he nearly 'had kittens' and protested loudly but it was too late. 'They' never showed him a plan again; he believes that his protests were too loud! If any arguments about layout do arise, the ergonomic studies in Appendix VIII of *HBN6* will be powerful tools.

If the development is phased, remember it must be workable at all stages.

Design Briefing System

As planning gets under way, the booklet *DBS6* will be found very useful. It is that part of the *Design Briefing System* relating to the X-ray department, and was published at the same time as *HBN6* and intended

to be used in conjunction with it. It is a briefing aid designed to help Project Teams to identify users' requirements in a logical and recorded manner using a checklist approach, and to identify the planning decisions which need to be made. It offers a range of options with a simple cross-referencing system to allow the compatibility of decisions to be checked and the consequences of changed decisions to be followed through. By ticking options with some additional text, the Project Team members can make a record of decisions in their own copy.

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Case reports

Case presented to
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Cervical subluxation: a deceptive soft tissue injury

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Keywords: cervical vertebrae, subluxation, stress views

A case of delayed recognition of cervical spine subluxation due to soft tissue injury is reported, and serves as a warning of the dangers of interpreting X-rays in isolation from the patient's history and examination.

Case report

A 67-year-old woman was involved in a head-on collision whilst travelling in the front passenger seat of a car. She was wearing a lap-and-diagonal seatbelt at the time. She was placed in a cervical collar by the ambulance crew in view of the high-speed nature of the crash and also because she was complaining of neck pain.

On arrival at the Accident & Emergency Department she also had pain in her left shoulder and in her chest. This was associated with shortness of breath and paraesthesiae in both arms. She was conscious and orientated and there was no evidence of shock. She was very tender at the back of the neck, over the upper sternum and about the lower right ribs. She had no objective neurological deficit.

X-rays showed fractures of the left clavicle, the sternum and the lower right ribs. Views of the cervical spine showed spondylotic changes in the C4 to C7 area, with bridging osteophytes anterior to the C4/5

and C5/6 interspaces (Figure 1). This was in keeping with her previous medical history. It was felt that there was no evidence of fracture, subluxation or soft tissue injury on the X-rays. She was judged fit enough to go home, wearing a cervical collar and a sling.

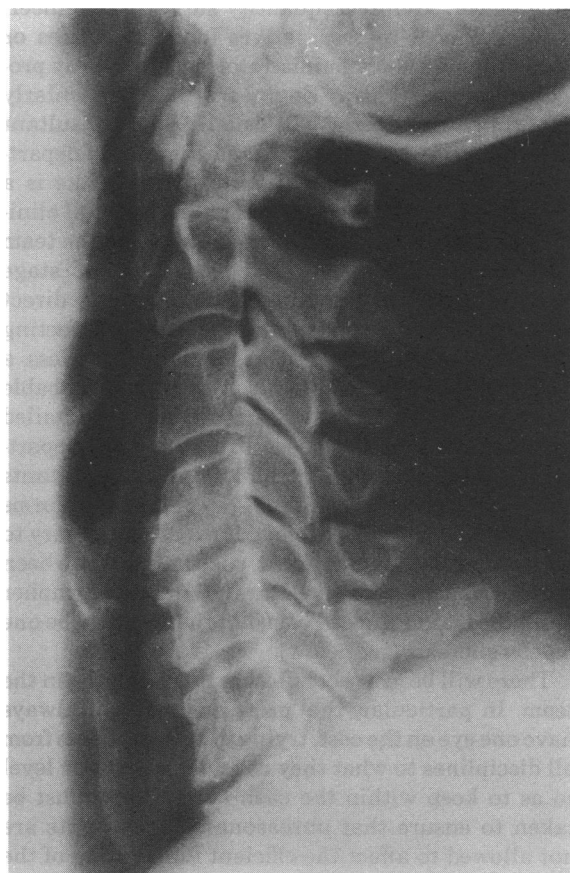


Figure 1. Initial X-ray showing spondylosis with no evidence of fracture or subluxation.